

## WHAT IS CLAIMED IS:

## 1. A semiconductor laser device comprising:

- a semiconductor substrate of a first conductivity type;
- a cladding layer of the first conductivity type provided on the semiconductor substrate;

- an active layer provided on the cladding layer of the first conductivity type, the active layer having a super-lattice structure including a disordered region in a vicinity of at least one cavity end face;

- a first cladding layer of a second conductivity type provided on the active layer;

- an etching stop layer of the second conductivity type provided on the first cladding layer; and

- a second cladding layer of the second conductivity type provided on the etching stop layer, the second cladding layer forming a ridge structure, the ridge structure extending along a cavity length direction and having a predetermined width,

- wherein a concentration of an impurity in the etching stop layer in the vicinity of the at least one cavity end face is greater than a concentration of the impurity in the interior of a cavity and equal to or smaller than about  $2 \times 10^{18} \text{ cm}^{-3}$ .

## 2. A semiconductor laser device according to claim 1,

- wherein the semiconductor substrate comprises a compound semiconductor material containing GaAs of the first conductivity type as a main component;

- the cladding layer of the first conductivity type comprises a compound semiconductor material containing GaP of the first conductivity type as a main component; and

- the active layer comprises a compound semiconductor

material containing GaP as a main component, and

the first cladding layer, the etching stop layer, and the second cladding layer each comprise a compound semiconductor material containing GaP of the second conductivity type as a main component.

3. A semiconductor laser device according to claim 1, wherein the semiconductor substrate comprises GaAs of the first conductivity type;

the cladding layer of the first conductivity type comprises AlGaInP of the first conductivity type;

the active layer comprises AlGaInP and GaInP;

the first cladding layer comprises AlGaInP of the second conductivity type;

the etching stop layer comprises GaInP of the second conductivity type; and

the second cladding layer comprises AlGaInP of the second conductivity type.

4. A semiconductor laser device according to claim 1, wherein a concentration gradient of the impurity in the second cladding layer in the vicinity of the at least one cavity end face, taken along a normal direction to the substrate from an upper face toward a bottom face of the substrate, is greater than a concentration gradient of the impurity in the interior of the cavity along the normal direction to the substrate, and is equal to or smaller than about  $2 \times 10^{18} \text{ cm}^{-3} \mu\text{m}^{-1}$ .

5. A semiconductor laser device according to claim 1, wherein a concentration of the impurity in the active layer in the vicinity of the at least one cavity end face is greater than a concentration of the impurity in the interior of the

cavity, and is equal to or smaller than about  $2 \times 10^{18} \text{ cm}^{-3}$ .

6. A semiconductor laser device according to claim 2, wherein the impurity is Zn.

7. A method for producing a semiconductor laser device comprising the steps of:

forming a semiconductor multilayer structure on a semiconductor substrate of a first conductivity type, the semiconductor multilayer structure including: a cladding layer of the first conductivity type; an active layer having a super-lattice structure; a first cladding layer of a second conductivity type; an etching stop layer of the second conductivity type; a second cladding layer of the second conductivity type; a band graded layer of the second conductivity type; and an impurity supply control layer;

disordering the active layer by diffusing an impurity at least in a predetermined region within the semiconductor multilayer structure; and

patterning the second cladding layer into a ridge structure by wet etching,

wherein a concentration of the impurity diffused in the etching stop layer within the predetermined region is greater than a concentration of the impurity outside the predetermined region and equal to or smaller than about  $2 \times 10^{18} \text{ cm}^{-3}$ .

8. A method according to claim 7,

wherein the semiconductor substrate comprises a compound semiconductor material containing GaAs of the first conductivity type as a main component;

the cladding layer of the first conductivity type comprises a compound semiconductor material containing GaP

of the first conductivity type as a main component;

the active layer comprises a compound semiconductor material containing GaP as a main component;

the first cladding layer, the etching stop layer, the second cladding layer, and the band graded layer each comprise a compound semiconductor material containing GaP of the second conductivity type as a main component; and

the impurity supply control layer comprises a compound semiconductor material containing GaAs as a main component.

9. A method according to claim 7,

wherein the semiconductor substrate comprises GaAs of the first conductivity type;

the cladding layer of the first conductivity type comprises AlGaInP of the first conductivity type;

the active layer includes a super-lattice structure comprising AlGaInP and GaInP;

the first cladding layer and the second cladding layer each comprise AlGaInP of the second conductivity type;

the etching stop layer comprises GaInP of the second conductivity type;

the band graded layer comprises GaInP of the second conductivity type; and

the impurity supply control layer comprises GaAs.

10. A method according to claim 7, wherein the impurity supply control layer has a thickness equal to or greater than about 100Å.

11. A method according to claim 7,

wherein a concentration gradient of the impurity diffused in the second cladding layer within the predetermined region, taken along a normal direction to the

substrate from an upper face toward a bottom face of the substrate, is greater than a concentration gradient of the impurity outside the predetermined region along the normal direction to the substrate, and is equal to or smaller than about  $2 \times 10^{18} \text{ cm}^{-3} \mu\text{m}^{-1}$ .

12. A method according to claim 7, wherein a concentration of the impurity diffused in the active layer within the predetermined region is greater than a concentration of the impurity outside the predetermined region, and is equal to or smaller than about  $2 \times 10^{18} \text{ cm}^{-3}$ .

13. A method according to claim 8, wherein the impurity is Zn.